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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/838,084	04/18/2001	Guo-Qiang Lo	IDT-1651	9576

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EXAMINER

FOONG, SUK SAN

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/838,084

Applicant(s)

LO ET AL.

Examiner

Suk-San Foong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 July 0703.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 5-10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 11-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. The finality of the Office Action mailed 4/4/03 is withdrawn in view of the new grounds of rejection below.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 11 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Cheng et al. ('382).

Cheng et al. discloses a method of forming trench isolation structure which includes forming pad oxide layer 12 over on semiconductor substrate 10 (Col. 4, lines 15-16, Col. 8, lines 9-13, and Figs. 1A and 3A), then forming silicon nitride layer 14 over pad oxide layer 12 (Col. 4, lines 15-20), then forming an antireflective layer such as silicon oxynitride layer 16 over silicon nitride layer 14 (Col. 4, lines 22-24), subsequently forming photoresist layer 18 on silicon oxynitride layer 16 (Col. 4, lines 31-32), then photolithographically patterning to define trench opening 8 (Col. 4, lines 32-36), then etching through silicon oxynitride layer 16, silicon nitride layer 14 and pad oxide layer 12 and substrate 10 (Col. 4, lines 37-40), subsequently removing photoresist layer 18 and etching through substrate 10 to form a trench (Col. 4, lines 53-57, and

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Fig. 1B), then forming thermal oxide layer 70a through rapid thermal oxidation to a thickness of about 100Å to 300Å and, thereby, conditioning the exposed silicon oxynitride layer 16 (Col. 8, lines 12-26, and Fig. 3A), subsequently performing wet clean step using HF (hydrogen fluoride) to clean the trench (Col. 8, lines 27-37, and Fig. 3B), growing liner oxide layer 72a after the wet clean step thereby conditioning the remaining silicon oxynitride layer 16 (Col. 8, lines 38-40, and Fig. 3C), then depositing insulating material 74 over liner oxide layer 72a (Col. 8, lines 47-48, and Fig. 3D), and subsequently performing a CMP process to removing portions of insulating material 74, the conditioned silicon oxynitride layer 16 and silicon nitride layer 14 (Col. 8, lines 58-64, and Fig. 3E).

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. ('382) as applied to claims 1-3, 11 and 18 above, and further in view of Ballantine et al. ('070).

Cheng et al. does not disclose that rapid thermal anneal is performed for about 20 seconds at a temperature of about 900°C.

Ballantine et al. teachings a method of forming a shallow trench isolation structure in semiconductor device which includes providing silicon substrate 1 (Col. 2, lines 6-7, and Fig. 5), then forming pad oxide 2 and nitride layer 3 over substrate 1 (Col. 2, lines 8-10), subsequently forming mask layer 5 over nitride layer 3 (Col. 2, lines 11-15, and Fig. 6), then forming trench 6 by etching through nitride layer 3, pad oxide 2 and substrate 1 (Col. 2, lines 16-20, and Fig. 7), subsequently forming oxide liner 8 in trench 6 by rapid thermal oxidation process at a temperature of about 900 to 1300°C for 1 second to less than 3 minutes to a thickness of about 225Å to 400Å (Col. 2, lines 30-43), subsequently filing trench 6 with insulating material (Col. 3, lines 16-24, and Fig. 10), and then planarizing trench 6 by chemical-mechanical polishing process (Col. 3, lines 25-36, and Figs. 11 and 13).

It would have been within the scope to one ordinary skill in the art to combine the teachings of Ballantine et al. with Cheng et al. because it would enable formation of thermal oxide layer 70a of Cheng et al. to be performed.

Note the disclosed temperature and duration of the oxidation process are within the recited ranges.

7. Claims 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. ('382) as applied to claims 1-3, 11 and 18 above, and further in view of Wolf.

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The combination process does not disclose the steps recited in claim 12.

Wolf teaches patterning photoresist layer by exposing the layer through a reticle in photolithography process (p. 407 and 476)

It would have been within the scope to one ordinary skill in the art to combine the teachings of Wolf with Cheng et al. because it would enable formation of photoresist layer 18 of Cheng et al. to be performed.

8. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. ('382) as applied to claims 1-3, 11 and 18 above, and further in view of Applicant's Admitted Prior Art (AAPA).

The combination process does not disclose the step in claim 19.

AAPA discloses a wet cleaning process in the presence of silicon oxynitride layer by using hydrogen fluoride (HF) and buffered oxide etch (BOE) (Instant p. 2-3).

It would have been within the scope to one ordinary skill in the art to combine the teachings of AAPA with Cheng et al. because it would enable the step of performing the wet clean process of Cheng et al. to be performed.

Response to Arguments

9. Applicant's arguments with respect to claim 1 and claims dependent thereon have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

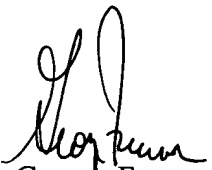
10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suk-San Foong whose telephone number is 703-305-0383. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 (7724, 3431, 3432).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

SV
July 22, 2003


George Fourson
Primary Examiner
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